Table 140.

Item, %[1]	Fines	Pellets	SEM	$P <$
DM	88.83	88.32	0.16	0.031
CP	13.58	15.24	0.48	0.021
ADF	4.09	3.59	0.20	0.087
Ca	0.74	0.74	0.07	0.975
P	0.50	0.53	0.02	0.354
Fat	9.00	7.71	0.42	0.039

[1]Values represent the mean of 32 samples.

(84.6%) but then decreased between the fat coater exit and load-out (84.6 vs. 81.9%). The largest increase in PDI was observed between the pellet cooler exit and fat coater exit (78.3 vs. 84.6%). Percentage fines decreased ($P < 0.05$; SEM = 0.76) from the pellet mill to cooler exit (9.44 vs. 8.54%), but then increased ($P < 0.05$; SEM = 0.77) after the fat coater and from the fat coater to load-out (14.20 vs. 20.46%). The largest increase in fines was observed between pellet cooler and fat coater exits and between the fat coater exit and load out (5.6 and 6.5%). For nutrient composition, DM and fat were greater ($P < 0.05$) and ADF tended to be greater ($P < 0.08$) in fines than in pellets. However, CP was lower ($P < 0.05$) in fines than in pellets. In conclusion, fines increased from the pellet mill to load-out and PDI improved from the pellet mill to the fat coater but then was poorer at load-out. Fines were higher in fiber and fat, but lower in CP when compared with pellets.

Key Words: feed mill, fines, pellet durability index, pellets

141 **Impact of particle size and grinding method (roller or hammermill) on apparent total tract digestibility of energy in growing pigs.** J. A. Acosta Camargo[1,*], S. A. Gould[1], C. K. Jones[2], C. R. Stark[2], J. F. Patience[1], [1]*Iowa State University, Ames,* [2]*Kansas State University, Manhattan.*

The objective of this study was to determine the impact of mean particle size (PS) of corn and wheat with 2 different grinding technologies on the apparent total tract digestibility (ATTD) of GE in growing pigs (GP) and in finishing pigs (FP). Ninety-six growing barrows (BW = 54.6 ± 0.4 kg) and 96 finishing barrows (BW = 110.2 ± 0.8; PIC 337 sires × C22 or C29), providing 8 observations per dietary treatment, were housed in individual pens and randomly assigned to 1 of 12 treatments. Corn and wheat were ground to 3 different PS (300, 500, and 700 microns), using either a roller mill (RM) or a hammermill (HM). Fecal samples were collected for the last 3 d of an 11 d feeding period. Titanium dioxide was used as an indigestible marker. Data were analyzed using the MIXED procedure of SAS. Particle size interacted with growth stage ($P < 0.01$); ATTD of GE increased in GP by lowering PS (81.4, 84.7, and 85.6% for 700, 500, and 300 microns respectively; $P < 0.05$); in FP, ATTD of GE increased from 700 to 500 microns ($P < 0.05$) and remained constant at 300 microns (83.65, 86.50, and 86.20% respectively). Particle size interacted with ingredient ($P < 0.01$); ATTD of GE improved in pigs fed corn by lowering PS (81.55, 84.44, and 85.94% for 700, 500, and 300 microns, respectively); in pigs fed wheat, ATTD of GE increased from 700 to 500 microns, but was similar at 300 microns (83.49, 86.75, and 85.87%, respectively). Particle size interacted with grinding technique ($P < 0.01$); ATTD of GE increased by lowering PS with RM (82.42, 85.40, and 86.68% for 700, 500, and 300 microns, respectively; $P < 0.05$); for HM, ATTD of GE increased ($P < 0.05$) from 700 to 500 microns but was similar ($P > 0.05$) at 300 microns (82.62, 85.79, and 85.14%, respectively). In conclusion, lowering PS improved ATTD of GE. This improvement was accentuated more in growing pigs than finishing pigs, in corn more than in wheat and when using the RM than the HM.

Key Words: hammermill, particle size, roller mill

Table 142.

Item	Mash	45 s Pellet	90 s Pellet	Extruded	SEM	$P =$
ADG, kg	0.95	0.99	1.01	0.98	0.012	<0.001
ADFI, kg	2.78	2.73	2.78	2.68	0.038	0.140
G:F	0.341	0.362	0.363	0.368	0.003	<0.001
HCW, kg	91.5	95.1	95.5	94.9	1.20	0.046
Yield, %	72.1	72.7	72.4	72.6	0.19	0.092
Backfat, mm	20.5	19.7	20.9	20.6	0.56	0.524
Loin depth, mm	60.9	62.7	62.5	62.7	0.83	0.353
Jowl iodine value	75.7	77.0	77.1	77.5	0.40	0.008

142 **Using extreme thermal processing to improve nutrient utilization of diets for finishing pigs.** G. E. Bokelman[1,*], K. F. Coble[2], C. R. Stark[1], J. C. Woodworth[1], M. D. Tokach[1], S. Alavi[1], C. K. Jones[1], [1]*Kansas State University, Manhattan,* [2]*New Fashion Pork, Jackson, MN.*

A total of 270 pigs (PIC 337 × 1050; initially 52.2 kg BW) were utilized in a 79-d experiment to determine the effects of feed processing methods (long-term conditioning or extrusion) on finishing pig growth performance and carcass characteristics. There were 7 or 8 pigs per pen and 9 pens per treatment. Treatments included 1) negative control: nonprocessed mash, 2) positive control: pelleted with 45 s conditioner retention time, 3) pelleted with 95 s conditioner retention time, and 4) extruded. Diets were fed in 3 phases with the same low energy formulation across treatments containing 30% corn dried distillers grains with solubles and 19% wheat middlings. Thermal processing, regardless of length or type, affected ADG and G:F ($P < 0.05$), but not ADFI ($P > 0.10$). Extruded diets tended to improve G:F compared with pelleted diets ($P < 0.10$). Interestingly, HCW was greater when pigs were fed pelleted diets compared with extruded diets, regardless of conditioning time ($P < 0.05$). However, pigs fed any thermally-processed treatment had greater HCW compared with those fed the negative control mash ($P < 0.05$). Thermal processing did not influence percentage yield, backfat, or loin depth when HCW was used as a covariate ($P > 0.10$).

However, pigs fed thermally-processed diets had greater jowl iodine value compared with those fed mash diets ($P < 0.05$). This experiment again confirms the benefits of thermally processing feeds to improve ADG and G:F, but neither extended conditioning nor extrusion extracted additional nutrients from low energy feedstuffs compared with traditional pelleting. However, this research suggests that more extreme thermal processing conditions may be used for feed safety purposes without hindering nutrient utilization.

Key Words: extrude, pellet, pig

143 **Effects of seaweed β-1,3-glucan (Algamune™) on growth performance of weaned piglets.**
Z. Cheng[1,*], Y. Wang[1], D. Hou[1], H. Zhang[1], Y. Chen[1], H. Lei[1], B. Wang[1], R. Levine[2], [1]*Animal Nutrition & Feed Center, COFCO Nutrition and Health Institute, Beijing, China,* [2]*Algal Scientific Corporation, Northville, MI.*

The experiment was designed to investigate Algamune™ (dried algae containing about 50% β-1,3-glucan) effects on growth performance. Healthy weaned piglets (n = 192), aged 35 d, were selected and divided into 4 treatment groups, with each group comprising 4 replicates of 12 pigs each. Pigs were fed ad libitum and given free access to water. The feeding trial ran for 22 d from the start of the nursery period. The experiment comprised 4 treatment groups: a control group (no Algamune™), the feed formula in control group contained soybean meal, extruded soybeans, corn, fish meal and premix, and 3 test groups, the feed formula in test groups were similar to that of control group, except that they also contained 0.05%, 0.1, or0.15 Algamune™ (equivalent to 500, 1000, 1500 g/MT, respectively). All dietary AA and nutrients met or exceeded NRC (1998) standards. Data were processed using software SPSS16.0 significant difference analysis. Compared with the control group, the test groups showed a trend towards an increase in ADG with the 0.05% β-glucan group showing a 5.1% increase, but the groups were not significantly different ($P = 0.945$, Table 143). Also, ADFI for the 0.05% β-glucan treatment group was numerically higher than the control while higher doses of β-glucan showed numerically lower ADFI ($P = 0.599$, Table 143). Compared with the control group, the 0.1% β-glucan group demonstrated a 4.5% decrease in FCR and the 0.15% β-glucan group a decrease of 7.8% ($P = 0.383$, Table 1). Overall, this experiment suggests a trend that diets supplemented with Algamune™ may improve piglet ADG and FCR, but more work is required to determine the optimal dose and validate any performance enhancements.

Key Words: β-glucan, growth performance, nursery pigs

Table 143. Effect of beta glucan on nursery pigs (mean ± standard error)

Group	Control	0.05% Algamune™	0.1% Algamune™	0.15% Algamune™
Initial WT, kg	12.21 ± 1.11	12.12 ± 2.32	12.18 ± 2.22	12.17 ± 1.96
ADG, g	478 ± 7.5	503 ± 45.3	487 ± 76.2	490 ± 76.2
ADFI, g	738 ± 87.8	778 ± 58.0	715 ± 101.9	692 ± 104.3
FCR	1.54 ± 0.17	1.55 ± 0.09	1.47 ± 0.05	1.42 ± 0.13

NONRUMINANT NUTRITION: SOW NUTRITION AND MANAGEMENT

144 **Effects of lysine and energy intake during late gestation on weight gain and reproductive performance of gilts and sows under commercial conditions.** M. A. Goncalves*, K. M. Gourley, S. S. Dritz, M. D. Tokach, N. M. Bello, J. M. DeRouchey, J. C. Woodworth, R. D. Goodband, *Kansas State University, Manhattan.*

This experiment was conducted to evaluate the effects of Lys and energy intake during late gestation on reproductive performance of gilts and sows. A total of 1,105 females (PIC 1050) were used from d 90 of gestation until farrowing. Treatments were a 2 × 2 × 2 factorial having 2 parity groups (P1 or P2+), 2 standardized ileal digestible (SID) Lys intakes (10.7 or 20.0 g/d), and 2 energy intakes (4,503 or 6,704 kcal/d intake of NE). Females were housed in pens by parity level, blocked by weight, and individually assigned to the dietary treatments within each weight block. Diets were corn-soybean meal based. Data were analyzed using generalized linear mixed models consisting with pen as the experimental unit for parity, and the individual female as the experimental unit for dietary treatments. Bonferroni adjustment was used to adjust multiple comparisons. Dietary treatments were Low Lys, Low Energy (LL), High Lys, Low Energy (HL), Low Lys, High Energy (LH), and High Lys, High Energy (HH). There were Lys × Energy ($P < 0.001$) and Parity × Energy ($P < 0.001$) interactions for BW gain. Increasing Lys or energy increased ($P < 0.001$) BW gain of both gilts and sows; however, the magnitude of response was greater when Lys and energy were increased together (LL: 11.94 ± 0.40, HL: 14.90 ± 0.40, LH: 18.45 ± 0.40, HH: 23.75 ± 0.40 kg ± SEM). Further, under high energy intake, there was no evidence for differences ($P = 0.996$) in BW gain between gilts (21.44 ± 0.39 kg) and sows (20.76 ± 0.60 kg). However, sows fed low energy intake had less ($P < 0.001$) BW gain (11.95 ± 0.60 kg) than gilts (14.89 ± 0.39 kg). There was no evidence for differences between dietary treatments in total pigs born ($P > 0.17$; LL: 15.1 ± 0.02; HL: 14.7 ± 0.02; LH: 14.9 ± 0.02; HH: 14.9 ± 0.02) or born alive ($P > 0.215$; LL: 14.1 ± 0.02; HL: 13.8 ± 0.02; LH: 13.7 ± 0.02; HH: 13.9 ± 0.02). There was no evidence for differences between dietary treatments in total litter birth weight ($P > 0.19$; LL: 19.3 ± 0.21; HL: 19.1 ± 0.21; LH: 19.2